Tender Document for
Design, fabrication, transportation, erection and commissioning of Vacuum Chamber

Satish Dhawan Space Centre SHAR

Indian Space Research Organisation

Sriharikota

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Table of Contents

List of figures

List of tables

1. Scope of the tender

1.1. Introduction

1.1.1. SDSC SHAR is planning to realize a vacuum chamber of size approx. 7.0m ID, Height 16.2m.

1.1.2. The scope of work under this tender covers Design verification, preparation of detailed fabrication drawing, manufacture, testing, inspection at manufacturer's work, sand blasting, painting, forwarding, transportation to place of erection, unloading, storing the materials till the time of erection, erection and commissioning at our site, carrying out performance testing required for commissioning of vacuum chamber at Production Plant, SDSC SHAR.

1.1.3. Arrangements shall be made by the supplier for the inspection and testing during different stages of its manufacture starting from the raw materials till the completion of works by the SDSC SHAR and/or Third Party Inspection Agency (TPIA) at the supplier's site as per the Quality Assurance Plan (QAP) schedule.

2. General Terms and conditions

2.1. Instruction to bidders

2.1.1. One set of proposal document along with the drawings is issued. Bidder shall sign and stamp each page of proposal as token of his acceptance & submit along with his offer. Document shall be scanned and uploaded in e-procurement portal. In case it is not possible to upload due to higher file size, hard copy of the balance documents (without any price figures) shall be submitted physically before due date.

2.1.2. Transfer of Proposal document issued to one Bidder to another is not permissible.

2.1.3. Proposal documents shall remain the property of Department and if obtained by one intending Bidder shall not be utilised by another without the consent of the Department.

2.1.4. The proposal shall be completely filled in all respects and shall be submitted together with requisite information. Any offer incomplete in any particulars is liable for rejection.

2.1.5. Bidders shall set their quotations in firm figures and without qualifications or variations or additions in the terms of the Proposal documents. Proposal containing qualifying expressions such as "subject to minimum acceptance" or

"subject to prior sale" or any other qualifying expressions or incorporating terms and conditions at variance with the terms and conditions incorporated in the Proposal documents are liable to be rejected.

2.1.6. Cost quoted shall be firm and fixed.

2.1.7. Price shall be quoted in Indian National Rupee.

2.1.8. Successful Bidder shall submit project execution plan and work break down chart, detailing the methodology of execution (process plan) within 15 days from the date of issue of purchase order.

2.1.9. Bidder should award any part of the work under the scope of this tender to any sub vendor only after obtaining necessary approval from the department. Bidder shall submit relevant information as required by the department. Department has every right to accept or reject the proposal submitted. Approval of the department is no way relieves the bidder from his responsibility and the bidder is wholly responsible for execution of work as per the specifications, terms, and conditions mentioned in this document.

2.1.10. Bidder shall indicate clearly such of those works planned to offload to his sub-vendor.

2.1.11. The erection works at this facility requires that, the party (successful bidder) shall adhere to good daily housekeeping practices. During erection, the party shall keep all work and storage areas used by them free from accumulation of waste materials. Scrap shall be removed from the site to the satisfaction of the purchaser.

2.1.12. Satish Dhawan Space Centre – SHAR (SDSC-SHAR) Sriharikota is declared as prohibited place under official secrets act 1923. Hence during execution of site works necessary security requirements enforced by the department from time to time shall be followed strictly.

2.1.13. SDSC SHAR / Third Party Inspection Agency (TPIA) shall have the right of inspection and supervision of the manufacturing process adopted by the Supplier for the manufacture of equipment at various stages through their authorized representatives. In case the manufacturing process adopted is not found suitable and commensurate with the desired quality of the equipment, the Supplier will be advised to adopt the correct manufacturing process which will be binding on the Supplier. SDSC SHAR's decision regarding the quality of work

and its acceptability shall be final and binding on the Supplier.

2.1.14. Defects in the material like fractures, cracks, blow holes, laminations, pitting, etc., are not allowed.

2.1.15. During the erection, testing and commissioning of Vacuum chamber at site in Sriharikota, the supplier has to make his own arrangements for boarding, lodging and transportation of his men and materials. However, subjected to availability, hostel accommodation may be provided by the Purchaser (SDSC SHAR) on chargeable basis.

2.1.16. Free electricity and water will be provided by the Purchaser (SDSC SHAR) for the erection, testing and commissioning works at the site.

2.1.17. Tools and tackles, other than those mentioned under free issue items, required shall be arranged by the party.

2.1.18. Before starting the site work (at SDSC SHAR), the party shall provide insurance to all his personnel working at site in Sriharikota against accidents. Till commissioning of Vacuum chamber, the safe storing and handling of Vacuum chamber is in the scope of supplier. Insurance for the same shall be borne by the party and shall be included in the cost.

2.1.19. The transfer of title of Vacuum Chamber to the Purchaser (SDSC SHAR) will take place only after satisfactory erection, testing and commissioning of the Vacuum chamber by the supplier and full acceptance by the Purchaser (SDSC SHAR).

2.1.20. Quote shall be based on F.O.R. Sriharikota.

2.1.21. All Taxes (like VAT, service tax etc.,) and duties applicable shall be indicated clearly in quotation.

2.1.22. Transportation & Transit Insurance are fully in the scope of supplier and the sameshall be borne by the party.

2.1.23. **Excise Duty:** SDSC SHAR is eligible for Excise Duty Exemption under Notification No 64/95 date 16/03/1995 as amended by Notification No 15/2007 dated 01/03/07 and we shall provide necessary exemption certificate.

2.1.24. No claim for payment of Excise Duty or Cenvat reversal will be allowed later. The suppliers have to consider this into account while submitting quotations.

2.1.25. CST with effect from 01.04.2007, the facility of Inter State purchases by Government Departments against Form-D has been withdrawn. Now the rate of CST on the Inter-State sale to Government Departments shall be the rate of VAT/State sales

Tax applicable in the State of the selling dealer. Accordingly the supplier has to clearly indicate the percentage the CST applicable against each case in their tenders.

2.1.26. **Customs Duty** SDSCSHAR is eligible for 100% Customs Duty exemption as per Notification No 12/2012 dated 17.03.2012. This may be taken account while quoting for imported items.CD exemption will be provided for procurement of 2 nos. of ring forged flanges only.

2.1.27. Bidders shall provide list of Foreign Exchange component considered for realization of vacuum chamber.

2.2. Publicity Relating To Tenders

2.2.1. Advertisements, press release or other specialized publicity documents, which are related to or reveal the existence of a tender and are intended by the Bidder for public distribution and/or the press, broadcasting, or television, shall be cleared/approved by the Department.

2.2.2. The Department may direct the Bidder to withhold such publicity or to require modifications to the publicity material. The Bidder shall comply with such direction.

2.3. Site Visit

2.3.1. Bidders may plan to visit and examine the site and its surrounding to familiarise themself of the existing facilities and environment and maycollect all other information which he may require for preparing and submitting the Bid and entering into the tender if required. Bidders shall visit within 15 days from the date of tender enquiry.

2.3.2. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the Bid and during implementation.

2.4. Validity of Offer

2.4.1. Bid shall remain valid for acceptance for a period of six months from the due date of submission of the Bid.

2.4.2. The Bidder shall not be entitled during the said period to revoke or cancel his Bid or to vary the Bid except and to the extent required by Department in writing.

2.4.3. Bid shall be revalidated for extended period as required by Department in writing.

2.4.4. In such cases, unless otherwise specified, it is understood that

validity is sought and provided without varying either the quoted price or any other terms and conditions of Bid finalised till that time.

2.5. Cost of Bidding

2.5.1. All direct and indirect costs associated with the preparation and submission of Bid (including clarification meetings and site visit, if any), shall be to Bidder's account and the Department will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bid process.

2.6. Project Monitoring

2.6.1. Bidder shall provide details of project team

2.6.2. Party shall submit the project status report every 15 days mentioning the status of various activities w.r.t. planned schedule for realization of vacuum chamber.

2.6.3. Party shall depute their Project team/ engineers for Monthly meeting to review the status and discuss/ resolve minor issues related to project execution at SDSC SHAR/ party's site based on mutual agreement on mutually agreeable dates.

2.7. Arbitration

In the event of any question, dispute of difference arising under these conditions or any conditions contained in the Purchase Order, (except as to any matters the decision of which is specially provided for by these conditions) the same shall be referred to the sole arbitration of the Head of the Purchase Office or some other person appointed by him, it will be no objection that the arbitrator is a Government Servant that he had to deal with matter to which the contract relates or that in the course of his duties as Government Servant he had expressed views on all or any of the matters in disputes or difference. The award of the arbitrator shall be final and binding on the parties of this contract.

2.7.1. If the arbitrator be the head of the purchase office.

(a) In the event of his being transferred or vacating his office by resignation or otherwise, it shall be lawful for his successor-in office either to proceed with the reference himself, or to appoint another person as arbitrator, or.

(b) In the event of his being unwilling or unable to act for any reason, it shall be lawful for the Head of the

Purchase Office to appoint another person as arbitrator: or

2.7.2. If the arbitrator be a person appointed by the Head of the Purchase Office in the event of his dying, neglecting or refusing to act, or resigning or being unable to act, for any reason, it shall be lawful for the Head of the Purchase Office either to proceed with the reference himself or to appoint another personas arbitrator in place of the outgoing arbitrator.

2.7.3. Subject as aforesaid, the Indian Arbitration and Conciliation Act, 1996 and the rules there under and any statutory modifications thereof for the time being in force shall be deemed to apply to the arbitration proceedings under this Clause. The arbitrator shall have the power to the extent with the consent of the Purchaser and the Contractor the time making and publishing the award.

2.7.4. The venue of arbitration shall be place as the purchaser in his absolute discretion may determine. Work under the purchase order shall, if reasonably possible, continue during arbitration Proceedings.

2.7.5. In case order is concluded on the public Sector Undertakings, the following Arbitration Clause will be applicable.

(a) In the event of any dispute or differences relating to the interpretation and application of the provisions of contracts, such dispute or difference shall be referred by either party to the Arbitration of one of the Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Bureau of Public Enterprises.

(b) The Indian Arbitration and Conciliation Act, 1996 shall not be applicable to the Arbitration under this clause.

(c) The award of the arbitrator shall be binding upon the parties to the dispute provided; however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such Additional Secretary when so authorised by the Law Secretary whose decision shall bind the parties finally and conclusively.

(d) The parties to the dispute will share equally the cost of arbitration as intimated by the arbitrator.

2.8. Performance bank guarantee

2.8.1. Party shall submit performance bank guarantee for 10% of the total order value valid till the completion of guarantee period.

2.8.2. **Bank guarantee** shall be submitted for free issue materials as listed in this tender document. Bank guarantee shall be provided from the date items are taken from SDSC SHAR till they are returned. (*Refer clause for free issue material*)

2.9. Payment terms

2.9.1. The payment will be released based on the following guidelines:-

Table 1. Payment Terms

(a)	Advance along with Order	Maximum 30% of supply value against submission of bank guarantee
(b)	Approval of design verification, fabrication process, QAP, fabrication drawings, detailed realisation schedule and order placement followed by LC opening for supply of imported ring forged flanges	10% of supply value
(c)	After Receipt of chamber at our site	50% of supply value + transportation charges + Taxes and duties applicable
(d)	Balance payment: After erection, commissioning and acceptance	10% of supply value + 100% Erection & commissioning charges + 100% Third Party inspection charges + Taxes & duties, against submission of Performance Bank Guarantee for a value of 10% of total order value.

2.10. Liquidated damage

2.10.1. Time is the essence of this order. If the supplier's defined scope

of work is not made by the end of delivery period, liquidated damage will be levied @ 0.5 % per week or part thereof subject to a maximum of 10% of value of undelivered stores.

2.11. Force majeure

2.11.1. Should a part or whole work covered under this agreement be delayed due to reasons of Force Majeure which shall include legal lockouts, strikes, riots, civil commotion, fire accident, quarantines, epidemic, acts of God and Government, fright embargoes, the completion period for work, plant or equipment referred to in this agreement be extended by a period not in excess of the duration of such Force Majeure. The occurrence shall be notified by either party within reasonable time.

2.12. Guarantee

2.12.1. The chamber shall be guaranteed against any manufacturing defects for a period of 12 months from the date of commissioning.

2.13. Delivery

2.13.1. The vacuum chamber shall be supplied within **Eleven months** from the date of award of purchase order.

2.13.2. Erection and commissioning shall be completed within **One month** from the date of receipt at site.

2.13.3. Intermediate milestones as identified mutually after placement of order shall be met with.

2.14. Drawings

2.14.1. Each drawing submitted by the Bidder shall be clearly marked with the following details.

a) Name of the Owner: Satish Dhawan Space Centre, ISRO

b) Project Title : 2nd Vacuum chamber

c) Purchase Order No :

d) Title of the Drawing clearly identifying the system, equipment or part.

e) Drawing, Revision Number and Date.

f) Name of the Bidder:

In case of Sub-Vendor or Manufacturer's drawing, name of the Bidder and Sub-Vendor or Manufacturer shall be incorporated.

g) Drawings duly signed in "checked" and “approved" columns.

h) Scale to which the drawing is drawn.

i) Cross references to all relevant drawings.

j) All relevant notes to the drawing:

All notes necessary for understanding and execution of work shown on a drawing shall be presented on the same drawing.

k) All legends to all notations.

l) Details of revisions carried out

m) Bill of materials shall be tabulated, wherever required.

n) All titles, notings, markings and writings on the drawing shall be in English

o) All the dimensions shall be in metric units.

2.14.2. If standard catalogues are submitted, the applicable items shall be highlighted therein.

2.14.3. The drawings shall indicate all dimensions and details of equipment, materials of construction etc.

2.14.4. For all revisions of the drawing, Bidder shall ensure that all revisions are clearly encircled with revision numbers marked on the drawing.

2.14.5. Bidder shall also ensure that general details of revisions are indicated for each revision in the revision block of the drawing along with the date and signed by the approving authority.

3. Documents Comprising the Bid

This is e-procurement tender. All the documents need to be scanned and attached to the bid under “documents solicited from Vendor” form. In case it is not possible to upload due to higher file size, hard copy of the balance documents (without any price figures) shall be submitted physically before due date.

On-line bids shall consist of the following:-

3.1. Part – I Technical and Un priced Commercial Part

3.1.1. Technical and un priced commercial part shall comprise the following documents/information. All the documents shall be scanned and uploaded in the ISRO e-procurement portal.

3.1.2. Submission of bid letter along with one set of proposal

document duly signed and stamped as token of acceptance. Scanned copy shall be uploaded in the ISRO e-procurement portal.

3.1.3. Power of attorney in favour of authorised signatory of the bid/ proposal documents.

3.1.4. Un priced copy of schedule of prices with all other commercial terms and conditions duly filled (Prices to be kept blank), signed and stamped

3.1.5. Audited balance sheet including profit and loss account for last three financial years showing annual turnover.

3.1.6. Latest income tax clearance certificate.

3.1.7. Latest solvency certificate from a scheduled bank.

3.1.8. List of projects in hand & completed during last five financial year indicating the name of client with contact details.

3.1.9. Work execution Planfor realizing the vacuum chamber

3.1.10. Project team details

3.1.11. Any other relevant document, bidder desires to submit.

3.1.12. Confirmation w.r.t bid qualification criteria as per Annexure-1&2.

3.1.13. Compliance statement as per Annexure-3. Deviations, if any, w.r.t technical and commercial terms & conditions shall be clearly brought out under deviation list. If deviations are not listed separately, it will be presumed that you are adhering to all the specification and terms & conditions given in this document.

3.1.14. Quality Assurance Plan as per Annexure-5. Party shall confirm the broad guidelines mentioned in QAP. However this is only indicative. Detailed QAP shall be submitted by the party after placement of order. Cost towards third party inspection shall be worked out based on the guide lines given in the QAP.

Note: All the above documents shall be uploaded in the ISRO e-procurement portal.

3.2. Part – II Priced Commercial Bid

Priced commercial bid shall contain schedule of prices and shall be filled in ISRO e-procurement portal. No deviations, terms and conditions, assumptions, discounts etc. shall be stipulated in price bid. Department will not take cognisance of any such statement and may at their discretion reject such bids.

3.3. Bid Submission

3.3.1. Bid shall be submitted in two parts

- Part -1 Techno-Commercial Part of the Bid
- Part-2 Price Part of the Bid

3.3.2. Offers should be submitted On-line using standard digital signature of class -3 with encryption/decryption options.

3.3.3. The tenders authorized online on or before the open authorization date and time will only be considered as valid tenders.

3.3.4. Prices shall be mentioned in the space/column provided in the ISRO e-procurement portal only for such purpose.

3.3.5. Price bid shall not be uploaded along with technical specifications. If so, such bids will not be considered.

3.3.6. Price bid format shall be filled saying "quoted" and shall be submitted along with the technical bid.

3.3.7. Physical copy of the bid will be accepted only in case if the file size is bigger and not possible to upload the same. In such case, the hard copy shall be submitted within due date. Documents received after due date will not be considered.

3.3.8. Prices quoted should be on the basis of F.O.R. Sriharikota.

3.3.9. The purchaser will not pay separately for transit insurance and same shall be included in the cost quoted by the Bidder.

3.3.10. All riks in transit shall be exclusively borne the contractor and thepurchaser shall pay only for such items as are actually received in good condition in accordance with the purchase order.

3.3.11. Bids duly filled in by the Bidder should invariably be submitted as stipulated in the e-procurement portal.

3.3.12. Department may open Part – I of the bid on the due date of opening at convenience. Price Bid (Part-II) of the bid of the technically and commercially acceptable bids shall be opened at a later date.

3.3.13. Department reserves the right to reject any or all the Bids without assigning any reasons thereof.

3.4. Bid Evaluation

3.4.1. The bidder shall provide all the relevant data/information/details required for evaluating the bid technical and commercially in the specific formats enclosed

with the tender. Apart from this, Bidder is free to add any other relevant information.

3.4.2. During evaluation, Department may request Bidder for any clarification on the bid/ additional documents/ information required. Bidder shall submit all clarifications/ additional documents/ information requested in original. If not submitted within the stipulated time department has right to reject such bids.

3.4.3. Techno-commercial discussion shall be arranged with Bidder, if needed. Bidder shall depute his authorised representatives for attending discussions.

3.4.4. The complete scope of work is defined in the Proposal document. Only those Bidders who undertake total responsibility for the complete scope of work as defined in the Proposal document only will be considered.

3.4.5. In case Bid does not fully comply with the requirement of Proposal document and the bidder stipulates deviations to the clauses of the proposal, which are unacceptable to the Department, the Bid will be rejected.

3.4.6. Performance of Bidder on similar nature of works executed/ under execution shall be taken into consideration before selecting the Bidder for opening his price bid.

3.4.7. The time schedule for completion is given in the Proposal document. Bidder is required to confirm the completion period unconditionally.

3.4.8. Department shall not be obliged to furnish any information / clarification to unsuccessful bidder as regard non acceptance of their Bids.

4. General Description

4.1. Vacuum Chamber

The vacuum chamber shall have the following features:

4.1.1. Vacuum chamber is an enclosure consisting of cylindrical shell with tori-spherical shaped lid and flat bottom.

4.1.2. It is provided with a manhole of size 700mm (NB) at the lower end of the shell. Hydraulically operated ring lock system is provided to ensure leak tight joint.

4.1.3. Shell and lid portions are provided with flanges and O ring grooves to ensure effective sealing.

4.1.4. Nozzles of different sizes are provided on the shell portion as well as on the lid for assembling the slurry feed system and mounting of various instruments viz., vacuum transmitters, cameras, lights etc., required to monitor, record and control critical process parameters. (Supply and installation of instruments and slurry feed system is not in the scope of bidder).

4.1.5. A gallery platform is provided inside the vacuum chamber.

4.1.6. Trunion brackets and tailing lugs are provided for vertical/horizontal handling and tilting of vacuum chamber.

4.1.7. Interface is provided on base plate for mounting weighing system.

4.1.8. Lid is provided with pipe supports with machined flanges to ensure proper interface with other equipments. However interfacing with other equipments at our site, is not in the scope of the bidder.

Drawing No.	Title	Revision
10-04-200-22-014/A1	General assembly of vacuum chamber	R - 1

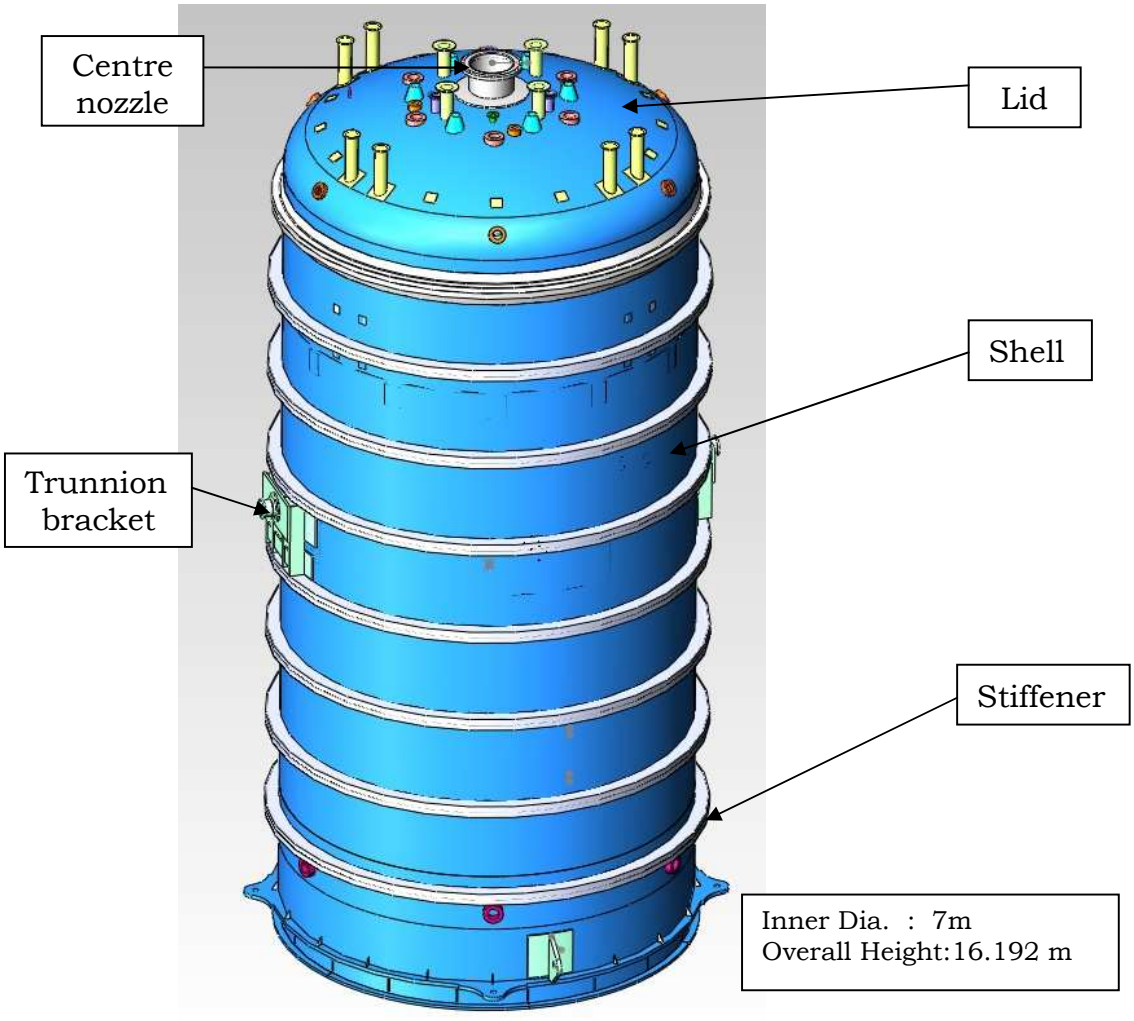

Fig. 1. Vacuum Chamber general arrangement

4.2. The Scope of work

4.2.1. Design verification, fabrication, testing, transportation, erection & commissioning of vacuum chamber as per the details given in drawings and technical specifications.

4.2.2. Vacuum chamber is designed as per ASME Sec VIII Div-I. Design drawings showing the major requirements w.r.t. function and fabrication are prepared and enclosed along with the tender. Details if any required to complete the fabrication shall be worked out by the party and shall get the approval from the Department.

4.2.3. The bidder shall carry out overall design verification of vacuum chamber and its accessories and necessary clearance shall be

obtained from Third Party Inspector. Report shall be submitted to SDSC SHAR within One month from the date of placement of order.

4.2.4. The dimensions given in the drawing are minimum required and shall be retained.

4.2.5. Sand blasting and Painting of inner and outer surface of vacuum chamber shall be carried out as per standard procedure.

4.2.6. Final coat of painting shall be carried out after receipt at SDSC SHAR before positioning inside the pit.

4.2.7. First fill of oil required for man hole door power pack.

4.2.8. One lot of fasteners, flanges, O-rings, gaskets, toughened glasses etc., required to carry out hydro test and functional test.

4.2.9. All bolts/studs shall be of class 8.8 or higher and shall be of Unbrako/DFL/TVS make only.

4.2.10. All the ports shall be fitted with dummy flanges during hydro test. Dummy flanges used during hydro test shall be supplied along with the vacuum chamber.

4.2.11. After hydro test, all the gaskets and O-rings shall be replaced with new set, after completion of erection of vacuum chamber at our site.

4.2.12. Chamber shall be tilted to horizontal for transportation. Party shall submit the detailed plan for tilting and transportation for review/approval.

4.2.13. Vacuum chamber shall be located on the concrete floor inside the pit of diameter 10.5m. Adequate number of shims of varying thickness required to level the vacuum chamber at the time of positioning shall be arranged by the party.

4.2.14. The details shown in the drawing shall be verified with actual site conditions and minor changes if any required shall be incorporated.

4.2.15. Party may visit the site to understand the interfaces and take essential dimensions wherever equipment is having interface with civil structure realised by others.

4.2.16. Minor changes if any suggested shall be incorporated at no extra cost.

4.2.17. For standard bought out components whose details are furnished in the tender either in the form of catalogue/data

sheet/vendor list, the bidder shall strictly adhere to the respective makes only.

4.2.18. For other brought out items/systems the Bidder shall adhere to the approved vendors list and shall ensure that all the features required for proper functioning of the system are available.

4.2.19. Shop inspection and tests as per specifications and as mentioned in this tender document shall be arranged by the bidder to enable DEPARTMENT / 3rd Party to inspect.

4.2.20. Wherever not specified, the shop inspection tests shall be as per recent codes applicable.

4.2.21. The Bidder's scope of work also includes erection, testing & commissioning of vacuum chamber at our site as detailed in this tender document.

4.2.22. Any other system not indicated herein, but required to make the system complete shall be included and provided by the bidder at no extra cost unless otherwise specifically excluded as indicated. Such of these items considered by the Bidder shall be identified and listed separately.

4.2.23. As this item is 'Oversized dimension consignment', Party shall carryout the route survey and finalise the transportation schemeand submit the report for approval.

4.2.24. Bidder is wholly responsible for getting necessary approvals from the concerned departments/ authorities to transport the vacuum chamber from party's site to SDSC SHAR.

4.2.25. Bidder shall describe fabrication, erection, testing and transportation methodology considered for vacuum chamber and lid along with his offer.

4.2.26. Bidder shall submit quality assurance plan (QAP) giving complete details for Purchaser's approval. Preliminary QAP enclosed with this tender document shall be taken as minimum required. Party shall prepare the detailed QAP based on the finalized fabrication process sequence and submit for approval to Third Party/Department. QAP given along with this tender shall be taken as broad guide line for considering the requirement of third Party inspection.

4.2.27. Third party inspection for stage and final inspection of vacuum chamber as indicated in QAP shall be arranged by the Bidder.

4.2.28. Quality records, history dockets, as built drawings (1 set of soft copy and 2 sets of hard copy) and all documentation related to

manufacturing, inspection, testing and erection.

4.2.29. Slings, ropes, D-shackles etc.,required for handling and tilting of vacuum chamber at SDSC SHAR shall be provided by the party.

4.3. Equipment and services to be provided by Purchaser

The following are the equipment and services that shall be provided by the department as a free issue.

4.3.1. All civil works required to install the vacuum chamber.

4.3.2. EOT crane (250t capacity) and mobile crane for tilting and handling of vacuum chamber at SDSC SHAR.However, it is the responsibility of the Bidder to mobilise his team having experience in handling, erection and commissioning of huge equipments.

4.3.3. Handling tackle and related linkages as listed in "List of free issue materials" (Refer table no.6, List of free issue materials).

4.3.4. Electrical, Instrumentation and hydraulic pipe routing for man hole door power pack at our site.

4.3.5. Vacuum line and vacuum pumps for carrying out vacuum test at SDSC SHAR after placement of chamber inside the pit at its identified location.

5. Codes and Standards

a) All equipment, systems and works covered under this specification shall comply with all currently applicable statutes, regulations, standards and safety codes in the locality where the equipment will be installed.

b) In particular, the latest editions of the following standards are applicable.

Table 2. Codes and Standards

(i)	Rules for construction of pressure vessels	**ASME Sec VIII Div I**
(ii)	Specification for pressure vessel plates, carbon steel for moderate and lower temperature services	**ASME Sec II Part A**
(iii)	Specification for forgings, carbon steel	**ASTM A 105**

c) Other national standards established to be equivalent or superior to the codes and standards specified are also acceptable. The bidder shall furnish English translation of all standards specified in this specification.

d) In the event of any conflict between the codes and standards referred to in the specification and the requirements of this specification, the more stringent of these requirements shall govern.

e) Unless indicated otherwise, all codes and standards referred to in this enquiry specification shall be understood to be the latest version on the date of offer made by the bidder.

6. Major Specifications

6.1. Design Inputs

6.1.1. The vacuum chamber and lid shall be designed for external pressure of 1.25 kg/cm^2.

6.1.2. Operating pressure is 1 torr (internal).

6.1.3. Design Temperature is ambient.

6.1.4. 1.5mm Corrosion allowance shall be considered.

6.1.5. Pad plates shall be provided on all nozzles as per ASME Section VIII, Div 1.

6.1.6. Maximum Acceptable leak rate is 50 torr-lt/sec. i.e. maximum allowed rise in internal pressure is 8 torr in 24 hrs, when chamber is isolated from atmosphere.

6.1.7. Hydro test of chamber shall be carried out for a pressure of 1.25 times the design pressure at party's site.

6.1.8. Verticality of vacuum chamber after erection shall be within 1mm, which shall be achieved by providing shim plates below the vacuum chamber.

6.1.9. After erection Shell flange shall be parallel to horizontal plane within 1mm.

6.1.10. Base plate for mounting of weighing system load cells and mounting kit shall be parallel to shell flanges within 1 mm.

6.1.11. All welds shall be ground.

6.1.12. Mill certified plates only shall be used for fabrication.

6.1.13. Gallery platform shall be designed for 200kg/m^2 live load.

6.1.14. 100% DP test for root and final weld pass.

6.1.15. 100% Ultra sonic test for plates as per QAP

6.1.16. 100% Radiography test for all butt welds as per QAP

6.1.17. The material of construction:

- Shell, lid, bottom plate and its support structure: SA 516 Gr 70
- Shell flange and lid flange: SA 266 Gr 4
- Chamber gallery: IS 2062 Gr B.
- Hand rail: SS 304

6.1.18. The Shell and lid flanges shall be realized by ring forging with integral hub for welding to the shell &lid respectively.

6.1.19. Welding of flange to shell/lid should be by full penetration butt weld. Rough machined Flanges shall be welded to the shell. Sufficient machining allowances shall be considered for final machining.

6.1.20. The final machining, hole drilling and grooves formation on shell flange shall be done after completion of welding of flange on shell/lid and stress reliving (SR). Flange drawing shall be submitted for approval before placement of PO.

6.1.21. Location, quantity and size of nozzle details required for lighting, camera port, view port, pressure transmitter, multi feed ports are indicated in the drawing.

6.1.22. Flatness and surface finish of flanges shall be ensured to achieve required seal compression for leak tight joint.

6.1.23. Both the flanges i.e lid and shell flanges shall be offered for inspection on machine.

6.1.24. In assembled condition (flange to flange without O rings and bolting), gap between shell and lid flanges shall not be more than 0.5 mm. The same shall be offered for inspection.

6.1.25. Proper inspection tools shall be used for inspection.

6.1.26. The entire fabrication activity shall be performed in a planned/sequential manner to achieve desired dimensional/geometrical tolerance specified in the drawing or functional requirement mentioned in this document.

6.1.27. Dimensions shown in the drawing are final acceptance dimensions. Allowances for machining and thinning due to fabrication process shall be added to arrive at material sizes.

6.1.28. Dimensional tolerance wherever not specified shall follow the standard open dimension tolerances provided in the drawing.

6.1.29. The effective throat thickness of a fillet weld shall be shortest distance from the root to face of the diagrammatic weld.

6.1.30. Wherever welded attachments are used to facilitate fabrication,

same shall be removed carefully by cutting or chipping and surface of material shall be finished smooth by grinding. As far as possible, hammering shall be avoided.

6.1.31. Edge preparation shall be carried out for all joints as mentioned in the drawing or as per standard fabrication procedure.

6.1.32. Major details of the vacuum chamber shall be as per the following drawings:-

Table 3. List of Drawings for vacuum chamber

Sl. No.	**Description**	**Drawing no**
1.	General assembly of vacuum chamber	10-04-200-22-014/A1
2.	Shell development with Nozzle pad location	10-04-200-22-017/A1 (Sheet 1 of 3)
3.	Details of Nozzles on Shell	10-04-200-22-017/A1 (Sheet 2 of 3)
4.	Details of Shell stiffeners	10-04-200-22-017/A1 (Sheet 3 of 3)
5.	General arrangement of vacuum chamber lid	10-04-200-22-016/A1 (Sheet 1 of 4)
6.	Details of Nozzles on chamber lid	10-04-200-22-016/A1 (Sheet 2 of 4)
7.	Details of Nozzles on chamber lid	10-04-200-22-016/A1 (Sheet 3 of 4)
8.	Lid With Lifting and locking Legs	10-04-200-22-016/A1 (Sheet 4 of 4)
9.	Detail-1 of vacuum chamber Bottom support structure	10-04-200-22-024/A1 (Sheet 1 of 2)
10.	Detail-2 of vacuum chamber Bottom support structure	10-04-200-22-024/A1 (Sheet 2 of 2)
11.	Gallery platform details	10-04-200-22-021/A1 (Sheet 1 of 2)
12.	Details of Gallery platform approach	10-04-200-22-021/A1 (Sheet 2 of 2)
13.	Handling arrangement of Vacuum Chamber	10-04-200-22-015/A1
14.	Vacuum chamber tailing lug details	10-04-200-22-019/A1
15.	Vacuum Chamber saddle support	10-04-200-22-023/A1
16.	Trunnion bracket	10-04-200-22-020/A1 (Sheet 1 of 3)
17.	Components of Trunnion and link assembly	10-04-200-22-020/A1 (Sheet 2 of 3)

Table 3. List of Drawings for vacuum chamber		
Sl. No.	**Description**	**Drawing no**
18.	Link assembly	10-04-200-22-020/A1 (Sheet 3 of 3)
19.	Handling Tackle for vacuum chamber	10-04-200-22-022/A1 (Sheet 1 of 2)
20.	Pin assembly for vacuum chamber handling tackle	10-04-200-22-022/A1 (Sheet 2 of 2)
21.	Spider arm for vacuum chamber	10-04-200-22-018/A1

6.2. Loads on vacuum chamber/lid

Following loads shall be considered during design check of vacuum chamber and related handling items like Trunnion brackets, link plates, spider, gallery, saddles, etc.

6.2.1. Internal operating pressure1 torr vacuum.

6.2.2. 1.25 ksc external pressure.

6.2.3. Hydro test of chamber in vertical condition at 1.25 times the design pressure.

6.2.4. 200t weighing system (not in the scope of supplier)

a) It is located on 70mm thick bottom plate of vacuum chamber.
b) Number of supports – 3 nos.
c) PCD of supports – 3600 mm
d) Total load – 200t
e) Drawing no: 10-04-200-22-024\A1 (sheet 2 of 2)

6.2.5. 15t weighing system (not in the scope of supplier)

a) It is located on vacuum chamber lid
b) Number of supports -4 nos
c) PCD of supports – 2200 mm
d) Total Load – 15t
e) Drawing no- 10-04-200-22-016/A1, Sheet 4 of 4

6.2.6. Lower deck (not in the scope of supplier)

a) Lower deck supports are derived from lid
b) Number of supports – 12 nos at PCD 5800 mm & 8 nos at 3700 PCD

c) Total Load –7.5t

d) Drawing no- 10-04-200-22-016/A1, Sheet 4 of 4

6.2.7. Lid lifting arrangement (not in the scope of supplier)

a) Lid is attached to working platform by means of 4 nos of hydraulic cylinders

b) PCD of cylinder supports – 6000 mm

c) Drawing no- 10-04-200-22-016/A1, Sheet 4 of 4

d) Self-weight of lid + weight of 15t weighing system + Lower deck

6.2.8. Lid locking arrangement (not in the scope of supplier)

a) During non process time, lid is locked with working platform by 4 nos of pins.

b) No of locking points – 4 nos

c) PCD of lid lock supports – 6000 mm

d) Drawing no- 10-04-200-22-016/A1, Sheet 4 of 4

e) Self weight of lid + weight of 15t weighing system + Lower deck

6.2.9. Load due to gallery platform (Refer drawing no: 10-04-200-22-021/A1 Sheet 1 & 2)

6.2.10. Load on tailing lug during tilting.(Refer drawing no: 10-04-200-22-19/A1)

6.2.11. Load on spider during tilting and handling (Refer drawing no: 10-04-200-22-018/A1)

6.2.12. Load on Trunnion bracket during Vertical/Horizontal handling of vacuum chamber including lid shall be considered. (Refer drawing no: 10-04-200-22-020/A1 Sheet 1,2& 3)

6.2.13. Load due to transportation of vacuum chamber in horizontal condition on two saddles. (Refer drawing no: 10-04-200-22-023/A1)

6.2.14. Loads acting on shell during different stages of handling, transportation shall be considered.

6.3. Vacuum Chamber Lid and Nozzles Assembly

Drawing No.	Title	Revision
10-04-200-22-016/A1 (Sheet 1,2,3,4 of 4)	Chamber lid and nozzle assembly	R - 1

Table 4. List of nozzles available on chamber lid

Nozzle No.	Position	Size	Purpose	Qty.
N1	Center	750	Feed port	1
N2	PCD 2200	150	Multi feed port	3
N5	PCD 2700	100	Camera port	4
N6	PCD 2600	150	View Port	6
N7	PCD 3000	200	Light port	6
N9	PCD 5000	15	PT on Lid	2
N14	PCD 2000	80	Drip collection port	1
N17	PCD 6800	150	Additional view port	6

6.3.1. After fabrication and inspection of the vacuum lid, the nozzles and fittings are attached to the lid by full penetration welding.

6.3.2. Apart from the vacuum load, lid is supporting hopper (15t load) as shown in drawing no 10-04-200-22-016/A1 Sheet 4 of 4.

6.3.3. Lid will be connected to structural platform (lower deck) using lid lifting and lid locking legs. (Refer Drawing no 10-04-200-22-016/A1 Sheet 4 of 4).

6.3.4. Verticality of lid lifting and lid locking legs shall be maintained within 1mm w.r.t. flange face.

6.3.5. Parallality of lid lifting and lid locking legs flanges shall be maintained within 1mm w.r.t. flange face. The same shall be offered for inspection during fit-up stage to Third Party/SDSC SHAR.

6.3.6. Lid lifting and lid locking flanges shall be stich welded to the pipes. Final welding will be carried out by the Purchaser.

6.3.7. Structural platform (Lower deck) on top of lid and hydraulic cylinders are not in the scope of party.

6.3.8. Lower deck platform will be welded to lid by legs. Party shall provide pad plates as shown in the drawing no 10-04-200-22-016/A1 Sheet 4 of 4.

6.3.9. R.F pads wherever required, shall be provided during fabrication, as per ASME Section VIII, Div 1.

6.3.10. All nozzles shall be provided as per drawing. Angular position and height of nozzles shall be maintained exactly.

6.3.11. Marking of nozzles, lid lifting/locking legs and hopper legs shall be offered for inspection.

6.3.12. Distance between lid lifting legs and lid locking legs shall be maintained as per tolerance given in the drawing.

6.3.13. Stress reliving of lid along with flange shall be carried out before final machining as per the requirement given in this tender document.

6.3.14. PCD of all the nozzles shall be maintained w.r.t. central nozzle (N1).

6.3.15. Central nozzle (N1) neck and flange shall be welded to lid after completion of stress reliving and final machining of lid flange.

6.3.16. Central nozzle (N1) flange shall be parallel to lid flange within 1mm.Same shall be offered for inspection during fit-up stage to Third Party/SDSC SHAR.

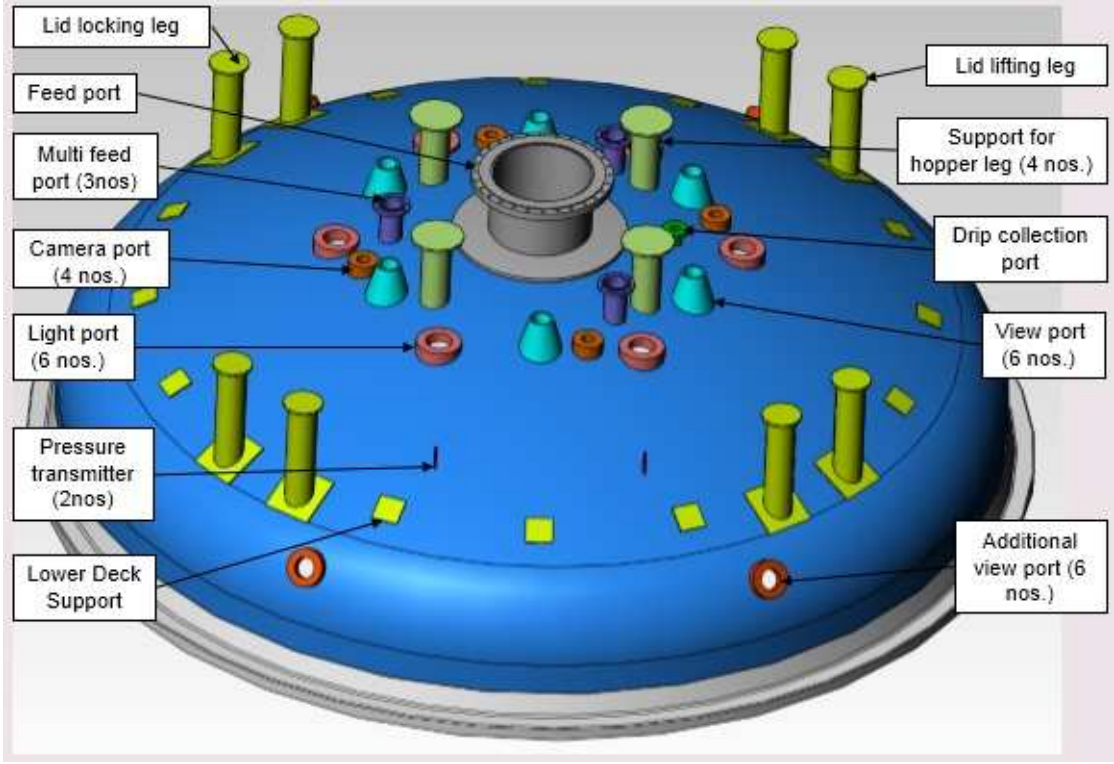

Fig. 2. Vacuum Chamber Lid showing various ports

Note:- Lower deck inner pad plates are not shown. Refer lid drawing No 10-04-200-22-016/A1 Sheet 4 of 4 *for details.*

6.4. Vacuum Chamber Gallery

Drawing No.	Title	Revision
10-04-200-22-021/A1 (Sheet 1 &2 of 2)	Vacuum chamber gallery	R - 0

6.4.1. Shall be designed for 200 kg/m^2 live load.

6.4.2. The vacuum chamber gallery is provided for inspection of the job inside the vacuum chamber. The gallery is erected inside the vacuum chamber.

6.4.3. The gallery comprises of four identical sectors. These sectors shall be joined together using fasteners.

6.4.4. The frames and decks shall be of removable type for access under the gallery.

6.4.5. Four ladders are provided for reach the gallery as per drawing no 10-04-200-22-021/A1(Sheet 2 of 2). The same shall be connected to the pad plate provided on the vacuum chamber shell using M12 fasteners.

6.4.6. Pre-buff SS 304 pipe/tubes shall only be used for hand rail/ladders.

6.4.7. Hand rail shall be of removable type as shown in drawing.

6.4.8. One end of the SS chains shall be welded to the hand rail and other end shall be provided with hooks for connecting to fixed pipes.

6.4.9. Buffing shall be carried on all SS components to obtain mirror finish.

6.4.10. Toe guard shall be provided all round on inner side.

6.4.11. Gallery platform shall be erected at our site after removal of spider arm.

6.5. Chamber Shell

Drawing No.	Title	Revision
10-04-200-22-017/A1 (Sheet 1,2,3 of 3)	Chamber shell	R - 1

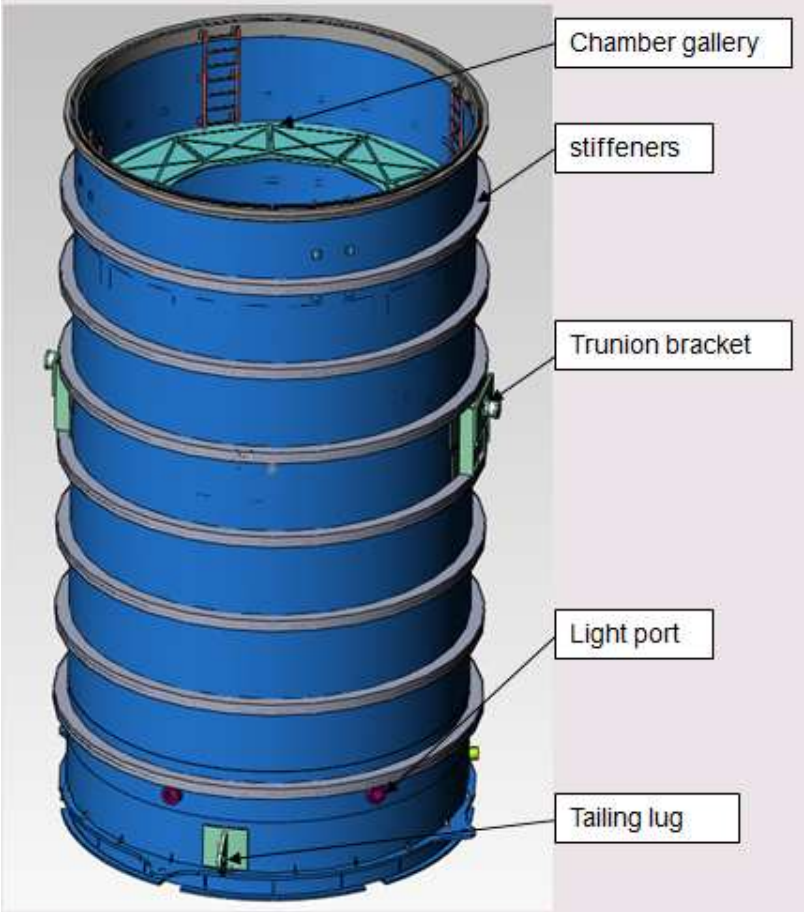

Fig. 3. Vacuum Chamber Shell

Table 5. List of nozzles available in shell

Nozzle No.	Position	Size	Purpose	Qty.
N3	290°	700	Manhole door	1
N 8	270°	200	Vacuum line	1
N13	45°,55°	200	Feed through	2
N15	15°,75°, 135°,195°,255°, 320°	200	Light ports	6
N16	315°	100	Spare port	1

6.5.1. The nozzles and fittings shall be welded to the shell by full penetration welding.

6.5.2. All the long seam/circumferential seam welds shall be

staggered as shown in the drawing.

6.5.3. Individual Shells shall be rolled and welded.

6.5.4. Proper spiders/tools shall be used during fitment of individual shells.

6.5.5. Trunnion brackets shall be welded at 180° apart from each other.

6.5.6. Tailing lug shall be welded at 90° to the Trunnion brackets.

6.5.7. Shell shall be made of minimum no of pieces as shown in the drawing.

6.5.8. Seal welding shall be carried out between stiffener plate and shell.

6.5.9. Stress reliving shall be carried out as per the requirement given in this tender document.

6.5.10. Shell flange shall be machined after completion of welding to final shell course and Stress reliving.

6.5.11. Final shell course with machined flange shall be welded to the remaining shell. Care shall be taken to ensure parallality of shell flange w.r.t. 70mm thick base plate as per tolerance given in Drawing. Requirement specified in the drawing shall be ensured.

6.5.12. Pad plates required for fixing of weighing system load cell (Sl. No. 100A & 100B of Drawing no – 10-04-200-22-024/A1 Sheet 2 of 2) shall be welded to 70mm thick base plate only after welding of final shell course with machined flanges to remaining portion of shell.

6.5.13. Parallality of Pad plates w.r.t. shell flange shall be maintained within 1mm.

6.5.14. All six pad plates, shall be in same plane within 0.5mm.

6.6. Flanges

Drawing No.	Title	Revision
10-04-200-22-014/A1 (Sheet 1)	General arrangement	R - 1

6.6.1. Ring forged machined flanges without O ring grooves and holes shall be used for fabrication.

6.6.2. Dimension of flanges shall be arrived considering distortion

due to welding and machining allowance.

6.6.3. Stress relieving shall be carried out after welding of flanges to shell course and lid.

6.6.4. Holes drilling and O ring grooves and face machining shall be carried out after completion of stress relieving.

6.6.5. Surface finish in the groove shall be as per the details given in the drawing.

6.6.6. The details of O ring are:-

a. Material – Viton,
b. Qty -2 sets (Each set consists of two O-rings.)
c. O ring cord diameter – $20^{-0.0/+0.5}$mm
d. Material shall confirm to ASTM D 1418 and test certificate shall be supplied along with the material.
e. Colour of the O-ring shall be black.

6.7. Bottom support structure

Drawing No.	Title	Revision
10-04-200-22-024/A1 (Sheet 1 &2 of 2)	Bottom support structure	R - 1

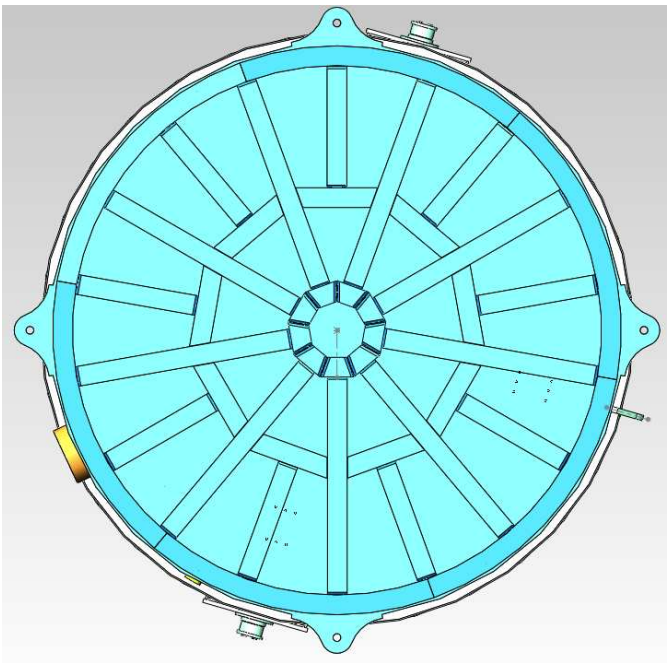

Fig. 4. Bottom support structure

6.7.1. For details of the chamber bottom support structure, refer to the drawing 10-04-200-22-024/A1 (Sheet 1&2 of 2).

6.7.2. Parallality of top plates (Item no.100A and 100B of dwg no.10-04-200-22-024/A1 sheet 2 of 2) w.r.t bottom structure is critical. Entire fabrication shall be carried out such that distortion is limited.

6.7.3. 70mm bottom plate shall be made with maximum two joints.

6.8. Trunnion Bracket and tailing lug

Drawing No.	Title	Revision
10-04-200-22-019/A1	Tailing lug	R - 0
10-04-200-22-020/A1 (Sheet 1,2,3 of 3)	Trunnion bracket	R - 1
10-04-200-22-018/A1	Spider Arm	R-1

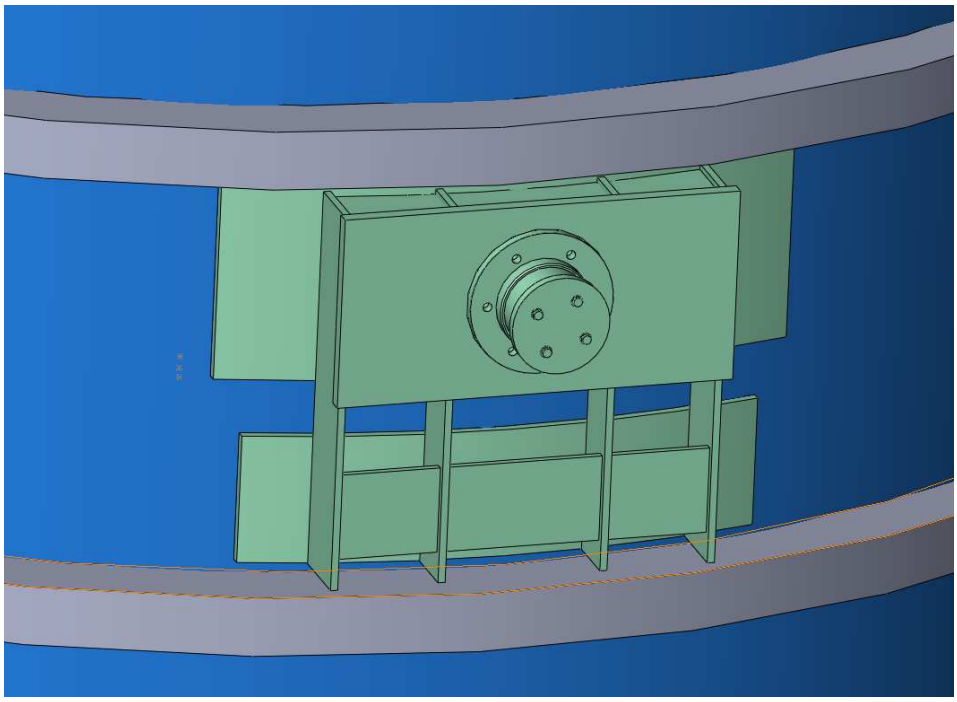

Fig. 5. Trunnion Bracket

6.8.1. Party shall check the CG of the shell and based on that height of Trunnion bracket shall be re-verified.

6.8.2. Trunnion bracket shall be fabricated and welded to vacuum

chamber shell at 180 deg apart.

6.8.3. Both the brackets shall be at same level.

6.8.4. Pins and its end cover required for assembly of link plate to Trunnion brackets shall be provided by the party. Links will be provided as free issue material. (Refer to the drawing No.10-04-200-22-020/A1 (Sheet 2 of 3)).

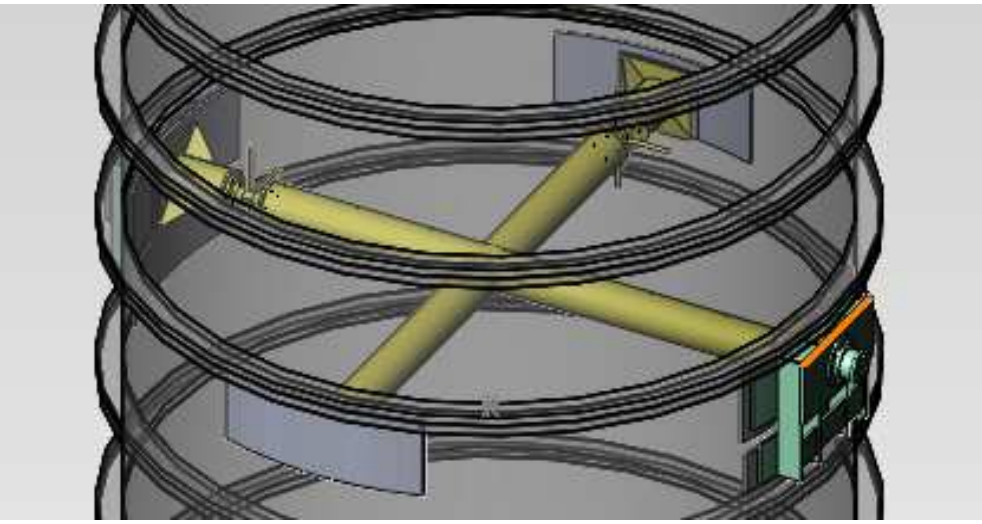

Fig. 6. Spider Arm

6.8.5. Spider arm shall be fitted inside the vacuum chamber to avoid buckling during tilting and vertical handling.

6.8.6. A portion of spider consisting of Screw jacks will be free issue to the party. *(Refer List of free issue materials)*Party shall integrate these screw jacks with spider arm main pipes as shown in drawing.

6.8.7. Pad plate with support for spider (Drawing no -10-04-200-22-018) fixing shall be provided on the inner side of the shell.

6.8.8. Spider shall be fixed using inbuilt screw jacks and shall be welded to inner side of vacuum chamber to retain in position.

6.8.9. Necessary supports may be provided to keep the spider arm in position.

6.9. Man Hole Door System

Drawing No.	Title	Revision
10-04-200-22-017/A1 Sheet 2 of 3	Details of nozzles on Shell	R - 0

6.9.1. The drawing for vacuum chamber indicates typical manhole arrangement. The BIDDER shall consider in his offer manhole door locked by hydraulic ring lock arrangement.

6.9.2. It consists of a fixed flange and a rotating flange. Rotating flange rotates against wedges screwed to fixed flange. Two hydraulic cylinders shall be provided for rotation of flange.

6.9.3. Wedges shall be selected in a manner to ensure proper compression of interface O ring.

6.9.4. A hydraulic power pack required for operation of hydraulic cylinders of man hole door locking/unlocking system.

6.9.5. Typical arrangement is shown below for bidder's guidance. Actual arrangement shall be submitted to the department for approval.

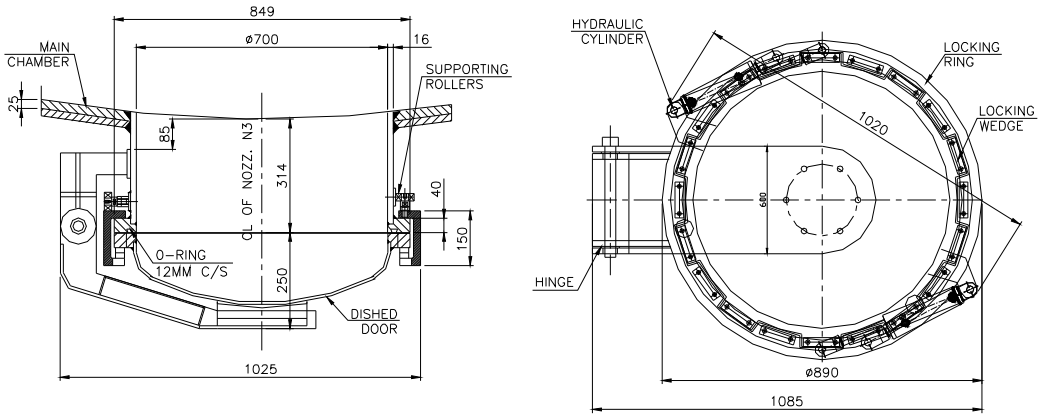

Fig. 7. Man hole door

6.9.6. Hydraulic ring lock shall be suitable for both vacuum and hydro test conditions.

6.9.7. Hydraulic Power Unit for man hole door shall comprise the following -

a. Hydraulic Pump
b. Electric Motor
c. Pump Protection Valve
d. Suction and Return Line Filters
e. Pressure line filter
f. Oil Tank
g. Pump Control Panel
h. Hydraulic Piping and bulkheads
i. Standard Hydraulic Power Unit Accessories

6.9.8. Party shall check and demonstrate the operation at our site after erection using temporary connections close to the vacuum chamber.

6.9.9. Hydraulic Components

Description	Model no/stroke/bore		Quantity
2 position DC Valve	Model no	D1VW 4C NJW 75	1
Pressure relief valve	Model no	S06550-04 11/06	1
External Gear Pump	Model no	PGP503A0046CH1H1NE3E1B1 Capacity – 6 LPM	1
Flow regulator with built in check valve	Model no	9F 800 S	4
Cylinder	Model no	BBHMIRN27M-M1100TR0084943	2
	Stroke	125 mm	
	Bore	40 mm	
	Max pressure	210 Bar	
Return line filter	Filter model no	FTA1A10QV25S8X	1
	Element model no	FTAE1B10Q	
Tank		Capacity approx. 30lt	
Note: - Make of all the above item shall be M/s Parker. The above mentioned items are only indicative. Actual quantity may vary to suite the functional requirement.			
HPP MOTOR for Man hole door for pumping of hydraulic oil	Type: 3Ø, 415V AC Squirrel cage induction motor Current: rating: 1.75 A Type of start : Delta		1 No.

7. Thermal Stress Reliving

Thermal stress relieving shall be carried out as per the following guidelines:-

7.1. After Bottom structure welding with 1st and 2nd shell course

7.1.1. Initially welding of 1st shell course with the bottom plate support shall be completed.

7.1.2. Subsequently, 2nd shell course shall be welded to the first shell course.

7.1.3. Structure with bottom plate, 1st shell course and 2nd shell course (as shown in Figure 8) shall be subjected to thermal Stress relieving.

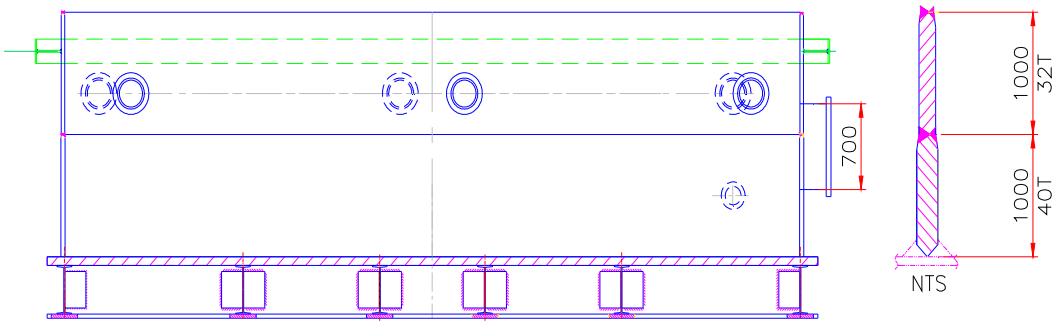

Fig. 8. Stress reliving - 1st and 2nd Shell course

7.2. After Shell flange welding to shell course

7.2.1. Thermal stress relieving shall be carried out after welding of shell flange to 7thShell course as shown in the Fig 9.

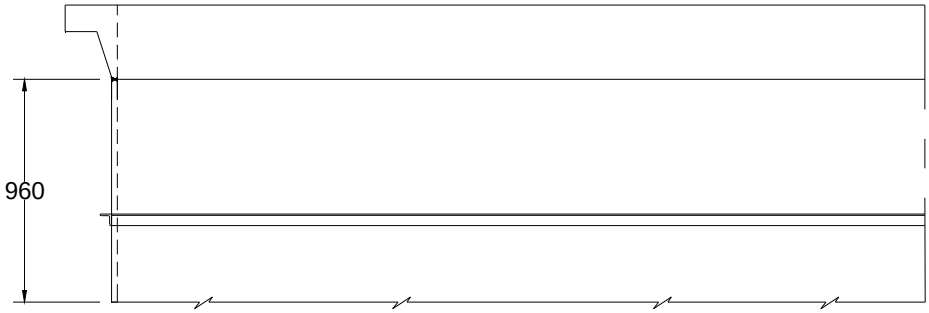

Fig. 9. Stress reliving- shell with flange

7.3. After Lid flange welding to chamber lid

7.3.1. After welding of lid flange to chamber lid as shown in fig.10,

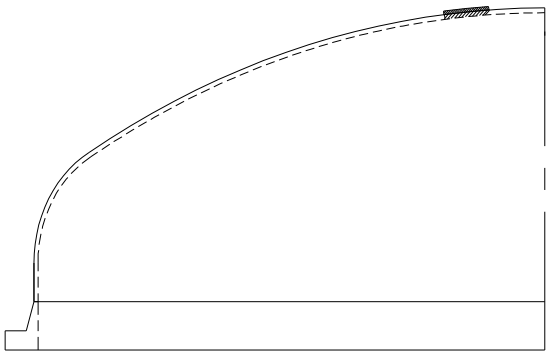

Fig. 10. Stress reliving- Lid with flange

7.4. General instruction for stress reliving

7.4.1. Stress Relieving cycle shall be decided based on the thickness and as per ASME Sec VIII Div 1.

7.4.2. Party shall submit the Stress reliving cycle for review and approval.

7.4.3. Natural gas fired/Oil fired/electric furnace shall only be used.

7.4.4. Baffles shall be used to avoid deposit of residues on the job.

7.4.5. Entire job shall be heated at once.

7.4.6. Local heating using induction coil is not acceptable.

7.4.7. Temperature recorders shall be used during SR and data shall be submitted for review.

7.4.8. Job temperature shall be monitored and recorded using laser based temperature measurement instrument.

7.4.9. Temperature Chart shall be submitted for review during inspection.

8. Transportation of Vacuum chamber

a) After completion of fabrication and hydro test, chamber shall be transported in horizontal condition.
b) Transportation scheme shall be submitted for review/approval.
c) Lid shall be assembled to chamber using suitable bolts/studs.
d) Vacuum chamber shall be transported using multi axle hydraulic suspension trailer of suitable capacity.
e) Party shall submit road worthy certificate for the trailer before start of transportation.

f) Road survey shall be carried out before start of transportation and report of same shall be submitted.
g) Party shall take necessary clearance from National Highway Authority of India and all other concerned departments/ authorities to transport the vacuum chamber with all accessories from Party's site to SDSC SHAR.

9. Handling and tilting of Vacuum chamber

9.1. At Party's site

9.1.1. The vacuum chamber fabrication shall be carried out in vertical condition and transportation shall be carried out in horizontal condition.

9.1.2. Party shall use suitable arrangement for tilting of vacuum chamber from vertical to horizontal.

9.1.3. Detailed scheme for tilting and transportation shall be submitted to Department for review and approval.

9.1.4. Spider shall be assembled to vacuum chamber before tilting and transportation.

9.2. At SDSC SHAR

9.2.1. For tilting of chamber at our site, EOT crane, Mobile crane and handling tackle will be provided at free of cost.

9.2.2. Necessary slings, dee shackles etc. required for unloading and tilting of vacuum chamber shall be provided by the Party.

9.2.3. Party shall work out a detailed scheme considering the site conditions and submit the details for approval.

10. Erection and commissioning

a) Party shall mobilize man power to SDSC SHAR for unloading and tilting of vacuum chamber from horizontal to vertical condition.
b) Based on the readiness of Casting pit, erection works will be scheduled. The chamber has to be lowered inside Casting pit.
c) Chamber shall be erected vertical at the centre of casting pit.
d) Verticality of shell and flatness of shell flanges shall be ensured as specified in this tender document.If required, shim plates of adequate size shall be used.
e) After completion of erection, Party shall remove the spider provided inside the chamber. EOT crane for handling of spider during removal will be provided by the department at free of cost.

11. List of free issue material

a) Party shall arrange for to and fro transportation of these items from SDSC to their site. Cost towards this shall be borne by the Party
b) Handling equipments like EOT crane and Mobile crane required for loading/unloading of items at SDSC SHAR will be provided at free of cost.
c) Whenever the item is required, the same shall be taken by the party after submission of bank guarantee equal to the cost of the items. Cost of the items is given in the following table.
d) The above items shall be returned in good condition.
e) Any damage to the item/equipment shall be rectified/repaired/replaced by the party at free of cost after obtaining necessary approval.
f) Modifications required if any shall be carried by the party without any extra charges. However Party shall obtain prior approval from the Department before carrying out any modifications.

Table 6. List of free issue materials

Sl. No.	Item Description	Drawing No	Quantity	Cost (in Lakhs)
1.	Saddles required for transportation of vacuum chamber in horizontal condition.	10-04-200-22-023/A1	2	18
2.	Tackle for vertical handling of vacuum chamber	10-04-200-22-022/A1 Sheet 1 of 2	1	21
3.	Pin assembly for Tackle	10-04-200-22-022/A1 Sheet 2 of 2	2	1.6
4.	Few parts of Link (i.e. Item Sl no 1, 2, 3)	10-04-200-22-020/A1 Sheet 2 of 3	2	2
5.	Link Assembly	10-04-200-22-020/A1 Sheet 3 of 3	2	2.1
6.	Few parts of Spider like Screw jacks for fixing to Spider as marked in the drawing (2 sets of Item	10-04-200-22-018/A1	2	1.0

Sl. No.	Item Description	Drawing No	Quantity	Cost (in Lakhs)
	Sl No 6, 7, 8, 13, 15, 16, 17)			
7.	250t EOT crane for vertical handling and tilting of Chamber at SDSC SHAR	---	1	---
8.	Mobile crane for titling of Chamber at SDSC SHAR	---	1	---

Note:- Sl. No. 16 (wear Plate) & 18 (Packing Plate) mentioned in Drawing no 10-04-200-22-015/A1, sheet 1 of 1 shall be supplied by the party.

12. Inspection & Testing

Inspection and testing shall be carried out as per approved QAP and ASME Sec VIII Div 1. QAP enclosed is only for reference. The party shall submit detailed Quality Assurance Plan based on finalised fabrication process flow.All the inspection tools and fixtures required for inspection shall be arranged by the party.

12.1. Dimensional inspection during fabrication

12.1.1. Party shall carry out all stage and final inspection as per QAP and inspection details shall be submitted toPurchaser/TPIA for verification.

12.2. Dimensional inspection after fabrication

12.2.1. Gap between lid and shell flange shall be measured and recorded in following conditions:-

a) Without interface O ring and without bolts connecting flanges.
b) Without interface O ring and with bolts connecting flanges.

12.3. Hydro test at Party' site

12.3.1. After completion of vacuum chamber fabrication, hydro test shall be carried out to a test pressure of 1.25 times of design pressure in vertical condition.

12.3.2. Good treated Water shall be used for hydro testing.

12.3.3. After hydro test, chamber shall be cleaned from inside as well asoutside.

12.3.4. Platform around the chamber shall be provided to carry out through inspection of all weld regions during hydro test.

12.3.5. Vent holes provided in the pad plates shall be plugged after hydro test.

12.3.6. All the nozzles shall be closed using standard dummy flanges.

12.3.7. All the dummy flanges used during hydro test shall be supplied along with the chamber.

12.3.8. After completion of hydro test, party shall change all the O rings, View glasses. This work shall be carried out after erection of vacuum chamber inside pit at SDSC SHAR.

12.4. After erection

12.4.1. Verticality of the chamber shall be measured and ensured within 1 mm.

12.4.2. Chamber flange and lid flange shall parallel to horizontal plane within 1 mm.

12.4.3. Chamber shall be positioned at the centre of casting pit.

12.4.4. Chamber 0° shall be matched withPit 0°.

12.4.5. Vacuum test shall be carried out. Vacuum pumps and related pipe line will be provided by Purchaser at free of cost.

12.5. Tests required to qualify the man hole door

12.5.1. Man hole door assembly shall be tested for operation and leak tightness before welding it to the main shell.

12.5.2. To carry out trials, the party shall use extended length of nozzle. One end of nozzle shall be fitted with Man hole door and other end shall be closed with dummy flange.Following qualification trial shell be carried out

a. Man hole operation with actual power pack
b. Hydro test at 3 kg/cm^2
c. Vacuum test at 0.5torr

Current drawn by HPP motor during operation shall be at max 80% of rated current.

After completion of trial, extra length of nozzle shall be cut and nozzle along with Man hole door shall be welded to main shell.

13. Painting

All the exposed carbon steel surfaces shall be painted as per following:-

a) Surface Preparation: Cleaning by wire brush or power tools to remove any loose dirt or mill scales from the surface. Sand blasting shall be carried to clean the inner and outer surface before painting operation. This shall be carried out after completion of hydro test.
b) Primer: One coat of zinc rich primer with red oxide and zinc phosphate pigments to achieve total DFT of 70 to 75 micron.
c) Final Coat: Two coats of epoxy paint of total 125 micron DFT.
d) Color – On outer surface shall be Blue, RAL shade 5015
e) Color on inner surface shall be White, RAL Shade 9003
f) Total DFT shall be 175 microns (min.)
g) Any intermediate cleaning required between successive coats of paint shall also be carried out as per manufacturer's standard.
h) First coat of paint shall be carried out after hydro test.
i) Final coat of paint shall be applied after receipt at our site.

14. Summary of Data to Be Furnished by Party

14.1. Along With Technical Bid

14.1.1. Proposed Quality Assurance Plan

14.1.2. Proposed Project execution plan and fabrication process plan.

14.1.3. Bar chart for supply & erection schedule indicating the date of completion of various activities so as to complete the execution of the tender within the time frame stipulated in the tender specification.

14.1.4. Proposed plan for tilting and handling of vacuum chamber at Party's site

14.1.5. List and Make of the bought out components that the bidder has considered in the proposal.

14.1.6. List and make of imported items.

14.1.7. Deviations from Technical Specification and proposed Design modifications

14.1.8. Compliance Statement for Clause by Clause compliance.

14.1.9. Hydraulic Circuit diagram and part list for the Hydraulic components used

14.1.10. Names of suppliers for steel materials considered

14.1.11. Bidder shall confirm/fill all enclosed Annexure 1-5 and submit along with the offer.

14.2. Data to Be Furnished By Party after the Award of Tender

14.2.1. Party shall submit copies of all drawings within four (4) week from the date of placement of purchase order. It is the responsibility of the Party to get the design verification reviewed by TPI and drawings shall be cleared within one month from the date of placement of order.

14.2.2. Any manufacturing and fabrication work carried out prior to the approval of the drawings will be at the Bidder's own risk and expenses.

14.2.3. Drawings submitted by the Party for approval shall be checked/reviewed by the PURCHASER and comments, if any, on the same will be conveyed to the Party. Party shall incorporate all these comments in his drawings.

14.2.4. Party shall send copies of instruction manuals along with the despatch of equipment. Instruction manual shall contain full details, as-build drawings of all equipment, erection procedure, testing procedure, operation & maintenance procedure of the equipment.If after commissioning and initial operation of the equipment, the instruction manuals require any modifications/additions the same shall be incorporated and the updated instruction manuals shall be submitted by the Party to Purchaser.

14.2.5. Quality Assurance Plan

14.2.6. Purchase orders for bought out components

14.2.7. Test Certificates for Steel Materials

14.2.8. Procedures for Welding, Qualifications of Welders, Painting and Finishing

14.2.9. Transportation Plan

14.2.10. Erection Plan

14.2.11. Inspection and Testing Plan

14.2.12. Commissioning Plan

14.2.13. Dimensional inspection reports generated during entire fabrication process, erection and commissioning.

14.2.14. All the reports generated during fabrication including material test certificates and other NDT tests.

14.2.15. Final as built drawings, 2 sets hard copy and one set soft copy in *.dwg format.

15. Major Milestones

Sl. No.	Description	Time (in days)	Remarks
1.	Placement of PO	T	
2.	Submission of PERT/Bar chart for overall schedule and details of project team	T+15	
3.	Submission of Fabrication process plan	T+15	
4.	Submission of Design verification report and Quality Assurance Plan	T + 21	
5.	Submission of GA drawings showing overall dimensions, fabrication/ manufacturing drawings etc.	T + 30	
6.	Work break down structure along with project milestones (micro level)	T + 30	
7.	Submission of purchase order copy (Un-priced) for raw materials / various bought out items/ like ring forged flanges, man hole door with ring lock arrangement etc.	T + 45	
8.	Receipt of all raw materials of shell and lid excluding flanges.	T + 60	
9.	Commencement of fabrication works	T + 60	
10.	Receipt of ring forge flanges	T + 180	
11.	Hydro test of vacuum chamber	T + 300	
12.	Receipt of chamber to SDSC SHAR	T + 330	
13.	Erection and Commissioning	T + 365	

16. List of approved Vendors

Sl. No.	Category	Item Description	Suggested Vendor
1.	Mechanical	Man Hole door assembly with ring lock arrangement	M/s Vacuum Techniques, Bangalore M/s Vacuum System Products Ltd, Bangalore M/s Hind High vacuum, Bangalore
2.	Mechanical	Chamber Main flanges	M/s Taewoong, Korea
3.	Mechanical	Plate raw material	M/s Jindal/Sail/Tisco/Essar

Sl. No.	Category	Item Description	Suggested Vendor
4.	Mechanical	fasteners and washers	Unbrako/DFL/TVS
5.	Mechanical	Third Party inspection	M/s Lloyds/DNV/Mecon/TCE
6.	Electrical	Power pack Motor	Bharat Bijlee/Crompton Greaves/ Siemens/ABB
7.	Hydraulic	Hydraulic cylinders, valves, filters power pack, fittings, clamps	M/s Parker
8.	Hydraulic	Hydraulic hoses	Parker
9.	Hydraulic	Hydraulic system integrator	M/s Hydrocare, M/s Pascal Hydraulics, Bangalore
10.	Neoprene/Viton Rubber items	O Rings/Gaskets	1. M/s Parker 2. M/s Bosco 3. M/s Vako 4. M/s Vajra Rubber Products, Kerala
11.	Misc	Paints and Primer	Berger/Asian/Shalimar/Nerolac
12.	Misc	Slings for handling chamber	Madras Hard Tools, Chennai, Tackle Tech, Mumbai, Sling set
13.	Other items	Approval to be obtained from department before placement of order.	

17. List of Annexure

Sl. No.	Description
Annexure-1	Bid qualification criteria
Annexure-2	Questionnaire
Annexure-3	Compliance Statement
Annexure-4	Price bid format
Annexure-5	QAP

Annexure-1

Bid Qualification Criteria for Supply of Vacuum Chamber

Bidders who are qualifying/meeting following Technical and Financial capabilities are eligible to participate in the bid for supply of Vacuum chamber. Bidder shall furnish all the details with documentary proof and submit the same along with quotation. Bids of the parties which are not meeting the following criteria will not be considered for evaluation and will be rejected without seeking any further clarifications. Bidder shall furnish the details of their resources in factory like manpower, machinery, quality system etc., for department to access their capability. Bidder shall submit above information in the format given in **"Questionnaire"** attached as Annexure-2 to this BQR.

Sl. No.	**Criteria / Requirement**	**Reply / Eligibility from M/s....**
1.	**Technical Qualification Requirements:** The bidder should meet the following technical qualifying requirements and shall submit relevant certificates/data to establish his credentials.	
1.1.	The Bidder should be an organization with previous experience in having executed contracts for design, engineering, manufacture, supply, testing of **internal/external pressure vessel/cylindrical shell.**	
1.2.	The Bidder shall have dedicated **design** team with experience in designing of pressure vessels as per ASME Section VIII Div 1. Details may be enclosed as listed in Annexure-2, Point no – 7.	
1.3.	The Bidder shall have dedicated **fabrication** team with experience of fabricating pressure vessel/cylindrical shell of more than 5m dia as per ASME Section VIII Div 1. Details may be enclosed as listed in Annexure-2, Point no – 7.	
1.4.	The Party should have successfully completed Design, Manufacture, Installation, Testing of at least **1no.** of internal/external pressure vessel of dia more than **5m**, length more than **10m** and weight more than **100t** **(or)** Large cylindrical shell of dia more than **6m**, length more than **16m** and shell thickness more than **50mm.** (Enclose documentary evidence).	

1.5.	The Party should have in house facility to machine jobs of diameter more than **7.5m** with indexing arrangement to drill holes of **Ø45mm** on flanges. In case, Party is considering the outsourcing of this particular machining work, Party shall indicate the probable sub vendors. The sub vendor shall have necessary experience in carrying out handling/ job setting of large size structures/chamber. Details of sub vendors may be provided.	
1.6.	Party shall have experience in arranging **third party inspection** in India and Abroad.	
1.7.	Party shall have experience and in house facility for **bending/rolling** of 40mm thick plates and diameter 7.5m.	
1.8.	Party shall have qualified welders with experience of **welding** of plate thickness 70mm or more.	
1.9.	Party shall have experience in carrying out **Radiography Test** of butt welds for plate thickness 70mm or more.	
1.10.	Party shall have experience in carrying out **thermal stress relieving** of job for sizes more than 8m X 8m X 2.5m.	
1.11.	Party shall have RCC floor area of sufficient strength to bear the weight of vacuum chamber during hydro test.	
1.12.	Party shall have experience in **handling and tilting** of large size jobs weighing more than **100t**.	
1.13.	Party shall have experience in carrying **sand blasting** of large size jobs.	
1.14.	Party shall have necessary capacity to carry out **hydro test** of entire chamber.	
2. Financial Qualification Requirements: The bidder should also meet the following financial qualification requirements:		
2.1.	The Bidder should have annual turn over of not less than a value of Rs.50crores per year for last **three** financial years ending 31-03-2014.	

2.2.	List of jobs carried out in past having a value of 10crores and above as a single PO Or 2 such of items of value 4 crores during last 10 years.	
2.3.	Bidder should possess a current Solvency Certificate from Nationalized Bank for an amount of not less than Rs. 4 crores.	
2.4.	IT/ TDS certificate shall be submitted for last 3 years.	
2.5.	Bidder shall submit audited statement of financial status for last 03 years.	
3.	**The following documents shall be submitted along with the application for prequalification of Bid:**	
3.1.	Party establishment certificate and nature of work	
3.2.	Detail of similar type works completed.	
3.3.	Satisfactory work Completion certificates, if any, from the clients of above referred works.	
3.4.	Performance Report of vacuum vessel established (with years of service) from End users, if any, with addresses and contact person with phone numbers.	
3.5.	Copy of audited Balance Sheets for last three years	
3.6.	IT / TDS certificates for last three years	
3.7.	Current Solvency Certificate	
3.8.	Duly filled **"Questionnaire"** (enclosed here with) with signature, name, phone no and company seal.	
3.9.	Structure and Organizational **Chart**	
3.10.	List of personnel with qualification & experience in the Party in the areas of a. Design, b. Production, c. Quality, d. Safety, e. Administration etc.	

3.11.	List of **Machinery & Equipment** available to carry out fabrication of pressure vessel/vacuum chamber.	
3.12.	Plant and Shop floor lay out.	
3.13.	Any other relevant information which add value to above.	

4. Important notes:

4.1. In the above technical qualification, bidder shall clearly indicate the list of sub vendors in case of outsourcing if any. The same shall be evaluated and approved by purchaser.

4.2. Bidder shall furnish all the above details fully and explicitly.

4.3. Please note that the "BID" without above mentioned documents/information in support of the eligibility criteria will be summarily rejected.

4.4. No further clarifications will be seeking in this regard.

5. Bid Selection Procedure and Process of Pre-Qualification

Step -1:Technical Bids will be opened and scrutinized for meeting all technical specification and supply conditions

Step -2: Short listing based on documents submitted, satisfying the all eligibility criteria given above by the Party or individual along with their Bid / application. (Non-submission of any document as given in above list within stipulated time leads to rejection of Bid)

Step–3: Subsequently Bidder's competency, their technical achievements and financial status will be evaluated suitable for this project. Feedbacks from Bidder's clients will be verified.

Step - 4: If required, visit will be made to their factory/ Party by technical team (ISRO or third party) for accessing the capability of manufacturer.

Step - 5: Visit to sites, wherever required by technical team (ISRO or

Third party) where Bidder has established above mentioned capacity chambers.

ISRO-SHAR reserves right to verify the information/data furnished by Bidder. If the same is found as fault or with any deviation the bid will be rejected.

Only those Bidders who are found suitable & meeting all above qualification Criteria/requirements will be finally qualified for opening the Price Bids for evaluation.

Annexure-2

Questionnaire
(Information to be provided by Party)

Name	Address
Phone	Mobile
Fax	Email

Sl. No.	Items/ Information	Specification/ details of items	Remarks
1.	Type of Industry (SSU, Medium, Govt, etc.,)		
2.	Year of Establishment		
3.	Annual Turnover (in Rs. lakhs) for last three years year ending up to 31-03-14 a. Turn over – 2013-14 b. Turn over – 2012-13 c. Turn over – 2011-12		
4.	Similar Orders executed during last 03 years, capacity of chamber, is to be mentioned. (Separate sheet can be attached for this) a. 2013-14 b. 2012-13 c. 2011-12		
5.	Quality Certification of company (ISO, TUV, etc.,)		
6.	Shop floor Area Covered		
7.	No of Employees (with qualification& experience) (Supplier shall mention contract personnel separately) **Design team** a. Engineers b. Draft man **Fabrication Team** a. Engineers b. Supervisors c. Technicians d. Quality control engineers e. Safety		

Sl. No.	Items/ Information	Specification/ details of items	Remarks
	Other a. Administrative staff		
8.	Raw Material Sourcing: a. Steel Plates b. Rolled sections, Flats c. Forged Ring d. Round bars		
9.	Welding /Fabrication Workshop (Type/capacity/ Quantity of machines shall be provided) a. MMAW machines b. GMAW machines c. Gas cutting set d. Plasma cutting machines e. Welding Fixtures		
10.	Handling facility available: a. Over head /Gantry crane details b. (Capacity, span, lift). c. Mobile cranes		
11.	Welding Professionals: a. No. of welders (MMAW) b. Qualification details c. Qualified by d. No. of welders (GMAW) e. Qualification details f. Qualified by g. No. of welders (TIG) h. Qualification details i. Qualified by		
12.	Details of Welding Inspection Equipment &welding inspector available with supplier (LPT, UT, MPT, X-ray, etc.)Any out sourcing can be mentioned.		
13.	Forming Facilities available (with brief specification of each machine) a. Shearing Machine b. Cutting machine		

Sl. No.	Items/ Information	Specification/ details of items	Remarks
	c. Bending machine		
14.	Machining Facilities available (with brief specification of each machine) a. Turning Lathe (Conventional/CNC) b. Vertical Turning Machine c. Milling Machine (Conventional/CNC) d. Drilling Machine(Conventional/CNC) e. Cylindrical Grinding Machine(Conventional/CNC) f. Any other machines		
15.	Details of Inspection facilities / Instruments available (Brief description & specifications shall be provided)		
16.	Design facility available: a. Drafting &Modelling software packages b. FEM software c. Other Software		
17.	Painting facility available a. Sand/ Abrasive blasting facility. b. Painting equipment c. Make of paints generally used.		
18.	General stock level of Raw materials/brought out items in the factory: a. Structural steel plates etc., b. Alloy steel round bars c. Bought out items d. Paints, etc.,		
19.	Any awards or recognitions obtained through product excellence		
20.	Collaborations with other reputed manufactures and OEMs with product details and Name of Principal supplier, country of origin		

Sl. No.	Items/ Information	Specification/ details of items	Remarks
	etc.,		
21.	List of documents enclosed with this questionnaire		
22.	Any other information like to add (separate sheet can be attached)		

Date :

Signature of competent person
Name :
Designation :
Company seal :

Annexure-4

Price Bid Schedule for vacuum chamber as per Technical Specifications and terms & conditions given in Tender

Tender No. & Date:
Bidder's Quotation No. & Date:

Note:

1. Bidder shall also submit the Un-priced Format along withTechno – Commercial Bid by mentioning "quoted" against each item. The same shall be uploaded along with technical specification.
2. The price bid should be submitted only as per the given below format. No row shall be left blank. Indicate "NA" in case the item is "not applicable".
3. Price shall be submitted on-line covering all the below components. Any un-filled price bid is likely to get rejected.

Bidder shall submit following Un-priced Format:-

Sl. no.	Description	Quantity	Party's Confirmation
1.	Basic Price at Ex Works for total supply of Vacuum Chamber excluding 7m ID and 7.452m OD shell and lid flanges. (inclusive oflid and shell flanges machining charges)	01 No.	
2.	Price at Ex works for supply of 2nos of shell/lid flanges, which is excluded in above Sl.No.1. (exclusive of lid and shell flanges machining charges)	1 set	
3.	Erection and commissioning charges of the vacuum chamber at our site.	01 Lot	
4.	Charges for Third party Inspection services for vacuum chamber design verification, manufacture, testing, erection & commissioning.	01 No. (Lump sum)	
5.	Transportation charges for vacuum chamber, including packing & forwarding charges.	01 No.	
6.	Sales Tax /VAT for Sl.No. 1.	% of supply value	
7.	Sales Tax /VAT for Sl.No. 2.	% of	

Annexure-4

Sl. no.	Description	Quantity	Party's Confirmation
		supply value	
8.	Service Tax on Erection charges of Sl.No.3	% of erection value	
9.	Service Tax on TPI charges (for Sl. No.4)	% of TPIA charges	
10.	Total Value of chamber including taxes & duties (1+2+3+4+5+6+7+8+9)		

Date:
Signature & Office Seal of the bidder

Annexure-5

Quality Assurance Planfor vacuum chamber

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
1.0	Raw material identification	1. Visual & dimensional 2. Manufacturers TC verification with material specification/ drawings or check test as per specification.	100%	Drawing ASME sec II part A ASME SEC V	Drawing ASME sec II part A	Material inspection report		R	R	
1.1	Pressure parts									
1.1.1	Carbon steel plates	2.1. Chemical properties 2.2. Mechanical properties 2.3. UT for plate thickness 25mm and above 2.4. Microstructure grain size # 5 finer for plates 3. Through thick tensile for plates of 40mm and above as per SA770/SA370 4. Identification mark verification and transfer of identification 5. Mechanical test		ASTM/BIS ASME SEC VIII DIV 1 ASME SA578 Level C	ASTM/BIS ASME SEC VIII DIV 1 ASME SA578 Level C					

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
		on simulation heat treatment samples. (NR) as applicable plate wise 6. Impact test as per code.								
1.1.2	Carbon steel pipe	1. Visual & dimensional 2. Manufacturers TC verification with material specification/drawings or check test as per specification. 2.1. Chemical properties 2.2. Mechanical properties 3. Identification mark verification and transfer of identification	100%	Drawing ASME sec II part A	Drawing ASME sec II part A	Material inspection report		R	R	In case fabricated , welds shall be 100% radiographed as per ASME Sec VIII Div-1
1.1.3	Carbon steel flanges – forged / fabricated from plate	1. Visual and dimensional 2. Manufacturers TC verification with material specification/drawings or check test as per specification 2.1. Chemical properties 2.2. Mechanical	100%	Drawing ASME sec II part A ASME SEC V	Drawing ASME sec II part A ASME SEC V	Material inspection report		W R	R	Slipon flanges shall have tale tale holes

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
		properties 3. Gasket seating area finish 4. UT for all flanges having thickness 25mm and above 5. Identification mark transfer and verification		 SA 578 Level C/ SA 388	 SA 578 Level C/ ASME SEC VIII DIV-2 AM203 for UT of forgings			W R R		
1.1.4	Fasteners, gasket & O-rings	1. Visual and dimensional 2. Manufacturers TC verification with material specification/drawings 3. Identification mark verification	100%	Drawing ASME sec II part A	Drawing ASME sec II part A	Material inspection report		W R R	R	
1.2 Non pressure parts										
1.2.1	Plate, pipe, rod etc	1. Visual and dimensional inspection 2. Manufacturers TC verification with material specification/drawings 3. Identification mark transfer and verification	100%	Drawing ASME sec II part A/ IS 2062	Drawing ASME sec II part A/ IS 2062	Material inspection report		W R R	R	
2. Welding										
2.1	Welding procedure qualification	WPS,PQR FOR/ CARBON STEEL GTAW/SMAW SAW process	100%	DRAWING/SPEC ASME SEC IX	DRAWING/SPEC ASME SEC IX	WPS/PQR & WQTR		W	R	WPS/ PQR

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
		&combination of process with PWHT								
3. Fabrication										
3.1	Dish forming Inspection of crown & petals	1. Visual and dimensional check 2. Cold forming of crown and petals 3. Profile 4. Normalizing of crown and petals 5. Mock assembly of crown & petal portions 6. Inspection clearance at press shop 6.1. Dimensional checking 6.2. Full size template checking 6.3. Thickness checking on knuckle area 6.4. PT check on knuckle area 7. Assembly and welding 8. WEP PT/MPI 9. PT/MPI of completed welds	100%	DRAWING ASME SEC VIII DIV-1 ASME SECV Approved NDT Procedure& PWHT Procedure	DRAWING ASME SEC VIII DIV-1 ASME SECV Approved NDT Procedure& PWHT procedure	Inspection report NDT report		W W W W W W W W	W	Production test coupon during normalizing of petals
3.2	Inspection of LS in shells	1. Weld edge preparation	100%	Drawing	Drawing	Inspection report		W	R	

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
	and Fabricated nozzles	&WEP PT 2. Long seam setup 3. PT check of welds in back gouged condition 4. Rerolling of shells if required 5. Visual and dimensional check of shells after welding 6. PT check of completed welds 7. RT for all butt welds before PWHT 8. UT after heat treatment wherever applicable		ASME SEC VIII DIV-1 ASME SECV ApprovedPWHT &NDTprocedure	ASME SEC VIII DIV-1 ASME SECV ApprovedPWHT &NDTprocedure	NDT report		W W R W R R R		
3.3	Inspection of circular seams in shells, heads & nozzles	1. Weld edge preparation & WEP PT 2. Circular seam setup 3. PT check of welds in back gouged condition 4. Visual and dimensional check of shells after welding 5. PT check of completed welds	100%	DRAWING ASME SEC VIII DIV-1 SHAR specification	DRAWING ASME SEC VIII DIV-1 SHAR specification	Inspection report NDT report PWHT report		W W W W W	R	

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
		6. RT for all butt welds before PWHT 7. UT after heat treatment wherever applicable						R R		
3.4	Nozzle pipe to shell / dish fit up & welding	1. Weld edge preparation & WEP PT 2. Fit up of nozzles with shell/head 3. PT check of welds in back gouged condition 4. Visual and dimensional check after welding 5. PT check of completed welds 6. UT of welds before PWHT	100%	DRAWING ASME SEC VIII DIV-1 SHAR specification	DRAWING ASME SEC VIII DIV-1 SHAR specification	Inspection report NDT report		W W W W W R	W	
3.5	Inspection of Supports , Internal Externals Attachments / fitup& Welding base with beams	1. Fitup of pressure parts to non pressure parts 2. Visual and dimensional check after welding 3. PT check of completed welds	100%	DRAWING ASME SEC VIII DIV-1	DRAWING ASME SEC VIII DIV-1	Inspection report NDT report		W W R	R	
3.6	Machining of shell and lid flanges	1. Dimensional inspection on machine 2. Mating of both	100%	1. Drawing	1. Drawing	Inspection record		W W	W	

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
		flanges and gap checking with feeler gauge								
3.7	Man Hole door	1. Visual & Dimensional inspection 2. Operation trial after fitment to nozzle 3. Hydro Test 4. Vacuum test 5. Operation trial after fitment to main shell.	100%	1. Drawing 2. Tender Document Clause "Tests required to qualifyman hole door"	1. Drawing 2. Tender Document	Inspection record		W W W W W	W	
1.0	Welding inspection	1. Visual & Dimensional inspection 2. 100% RT forall butt welds 3. 100% RT for Bottom plate and Girth flanges 4. PT exam on welds 5. PT-Root & Final for Base beam welds 6. Pneumatic test nozzle RF pad, SORF Girth & Nozzle flanges 7. PT & UT for Bottom plate filler welds	100%	1. Drawing 2. ASME Sec VII Div-1 3. Approved NDT Procedure	1. Drawing 2. ASME Sec VII Div-1 3. Approved NDT Procedure	Inspection record		W R R W W W R	R	
2.0	Post weld heat	1. NDT clearance of shell	100%	1. Drawing 2. ASME Sec	1. Drawing 2. ASME Sec	PWHT Chart		W	R	

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7		8		9
	treatment for bottom plate, shell course I & II (32mm thick & above)	2. Heat treatment charts 3. Hardness test after PWHT		VII Div-1	VII Div-1	Hardness Report				
3.0	Post weld heat treatment after completion of Girth flanges welding	1. NDT clearance of shell 2. Heat treatment charts 3. Hardness test after PWHT	100%	1. Drawing 2. ASME Sec VII Div-1	1. Drawing 2. ASME Sec VII Div-1	PWHT Chart Hardness Report		R	R	
4.0	After post weld heat treatment	1. Dimensional & Visual inspection 2. Heat treatment charts 3. 100% RT for all butt welds.	100%	1. Drawing 2. ASME Sec VII Div-1	1. Drawing 2. ASME Sec VII Div-1	Inspection report		R	R	
5.0	Final inspection before hydro test	1. Dimensional & Visual inspection 2. Final Dimension inspection 3. Review of all inspection documents	100%	1. Drawing 2. Inspection Document	1. Drawing 2. Tender Document	Inspection report		W	W	
6.0	Hydro static test	1. Visual Inspection 2. Check for test pressure and leakage		1. Drawing 2. Specification 3. ASME Sec VII Div-1	1. Drawing 2. Specification 3. ASME Sec VII Div-1	Hydro test report		W	W	
7.0	Vacuum & Leak Test	1. Visual Inspection 2. Check for test pressure and leakage		1. Drawing 2. Specification 3. ASME Sec VII Div-1	1. Drawing 2. Specification 3. ASME Sec VII Div-1	Vacuum Test report		W	W	

Sl No	Components operation	Characteristics/ type of checks	Quantum of check	Reference document	Acceptance norms	Formats of record	Agency			Remarks
							Party	TPI	SHAR	
1	2	3	4	5	6	7	8			9
8.0	Surface Perpetration & Painting	1. Visual 2. Paint thickness measurement		1. Drawing 2. Specification	1. Drawing 2. Specification	Panting report		R	R	
9.0	Final Certification	1. Hard Stamping 2. Document Verification 3. Inspection release note	100%	1. Drawing 2. Specification	1. Drawing 2. Specification	Inspection release note		W	W	

Manufacturer Quality Records

1. Manufacturer certificate
2. Material traceability summary sheet
3. Material test certificate
4. NDT Examination Reports
5. Final Dimensional Reports
6. Final Heat treatment chart
7. Hydro and leak test report
8. Hard stamp ruboff details

Note

1. All NDT procedure shall be submitted for approval
2. Material of construction as per approved drawings
3. Pressure gauge and instrument shall have valid calibration traceable to National standards.
4. Pressure gauge range shall be 2-4 times the pressure read on gauge. Dial size shall be minimum 150mm.
5. All requirements specified/approved drawings/specifications and applicable codes shall be fully complied.
6. Job specific heat treatment, thermal stress reliving procedures shall be submitted for review and approval.

7. Vacuum test shall be conducted after completion of hydro test at SDSC SHAR.
8. Final painting shall be carried out after receipt at SDSC SHAR.

Legends

H	-	Hold
R	-	Review
W	-	Witness
MTC	-	Material test certificate
TC	-	Test certificate
UT	-	Ultrasonic Test
RT	-	Radiography test
MPI	-	Magnetic particle test
DPT	-	Dye penetrant test